Are aquatic invertebrates useful for assessing wetland condition?

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General Abstract

Freshwater wetlands are one of the most biodiverse ecosystems and at the same time of the most threatened globally. New Zealand has lost 90% of its wetlands and of those remaining, 60% are considered degraded. Establishing accurate wetland inventories and assessing wetland condition are priorities for the management and conservation of these important ecosystems. Aquatic invertebrates are used worldwide to assess the condition of other aquatic ecosystems such as rivers and lakes; however, their use for assessing wetland condition has not been extensive.

A wetland's hydroperiod is considered one of the most important environmental variables affecting wetland biota and one that has also been most altered by anthropogenic stresses. The second chapter of this thesis analyses the effect of hydroperiod on the macroinvertebrate communities of the Ō Tū Wharekai (Ashburton lakes) wetland system in New Zealand. A total of 40 taxa from 11 orders were recorded from 4 permanent lakes, 3 semi-permanent ponds, and 7 temporary ponds in September 2016. The macroinvertebrate assemblages in lakes were distinct to those in semi-permanent and temporary ponds. Overall, temporary ponds were slightly more diverse than the semi-permanent ponds and lakes. Semi-permanent and temporary ponds were most similar to each other in macroinvertebrate composition. They host more species of small crustaceans such as cladocerans and ostracods, while species belonging to the Trichoptera, Odonata and Hirudinea orders were only present at permanent sites. The results emphasize the need to include small and seasonal wetlands in freshwater conservation efforts since they often hold unique biotic communities.

In the third chapter, the potential to use macroinvertebrate communities in wetland assessment is evaluated. The macroinvertebrate communities of 14 freshwater wetlands in the lower North Island were sampled. The sites represent a gradient of wetland condition and include urban lagoons, agricultural swamps and lacustrine wetlands with recognized ecological value. A total of 63 invertebrate taxa were identified, of which crustaceans were the most abundant. There appeared to be no link between the

composition and diversity of macroinvertebrate communities and wetland condition. However, of the habitat characteristics measured at each site, nutrient enrichment appeared to be the most important variable in determining macroinvertebrate assemblages. On the other hand, macrophyte communities appear to be more reflective of wetland condition. There are considerable knowledge gaps regarding invertebrate response to environmental change in freshwater wetlands and this limits their suitability as a biomonitoring tool.

Assessing wetland condition accurately is one of the greatest challenges for the management and conservation of these threatened ecosystems. Aquatic invertebrates are used as biomonitoring tool for many freshwater ecosystems but not wetlands. This is because the way wetland invertebrates respond to environmental change remains unclear. So far, in New Zealand, there appears to be no link between wetland condition scores and invertebrate communities. Thus, the final section of this thesis proposes a simple dichotomous wetland condition scoring system exemplified with information from the 14 freshwater wetland sampled in the North Island. The method has limitations, but allows the integration of biotic data into wetland condition assessment.

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